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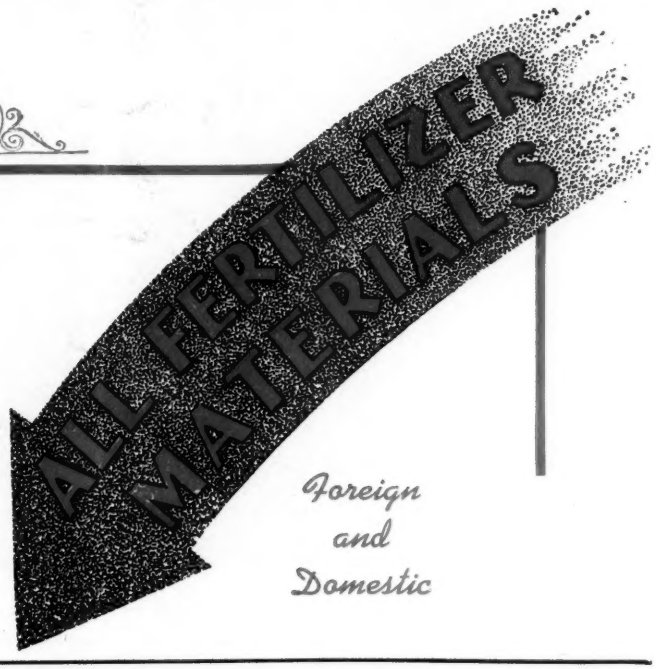

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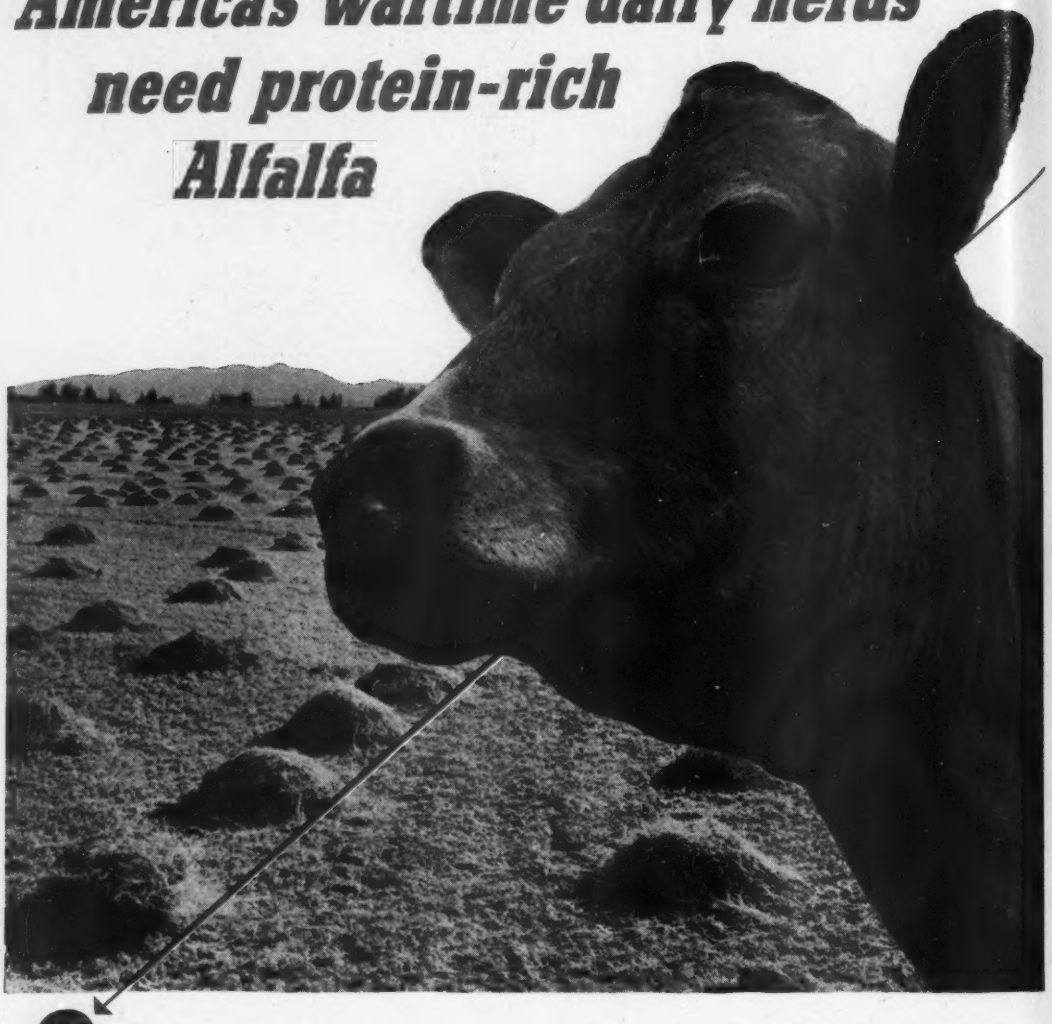

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See page 23

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The Potash Problem in Illinois[1]

By R. H. BRAY

Department of Agronomy, University of Illinois, Urbana, Illinois

THE potash problem in Illinois has been of vital concern to me for the best part of the 21 years which I have spent studying the chemistry of Illinois soils and the relation of soil chemistry to crop production in the Corn Belt.

It was back in 1930 that I first started studying the chemistry of soil potassium with respect to soil fertility. This followed hard on the heels of the soil test for phosphorus, put out in 1929, which had already proved its worth in the solution of the phosphate problem that had become critical at that time. Perhaps most of you can recall the time when we were recommending that large amounts of phosphate be applied to soils as part of our management system. The soil experiment field results had told us that some soils responded to phosphate and some did not, but they could not tell us which particular farm soils needed phosphate and which did not. As a result, many farmers were not being benefited by applying phosphates.

Studies with the soil test showed that the lack of response was not because the phosphate being used was not a satisfactory phosphate, but because the soils which did not respond already contained sufficient amounts of available forms of phosphorous. The soil test for phosphorus readily picked out, with relatively few exceptions, the soils which did not respond and put phosphorous used on a practical footing. This test represented one of the first practical applications of soil chemistry to the solution of nutrient needs which could be applied to each individual farm soil and thus give specific recommendation to each farmer.

It appeared, therefore, that the thing to do about our potash problem was to find out about our chemistry of soil potash and crop production and then design a soil test which could accomplish the same results as had been accomplished by the acidity and phosphorous tests.

Now just what is the potash problem in Illinois? The simple facts of the case in 1930 were:

1. A large number of the Illinois experiment fields were giving good responses to added potash fertilizers.
2. These responses varied widely, with no two fields giving exactly the same response.
3. There was no practical way of answering the following questions for any particular 40-acre field:
4. (a) Is this field potash-deficient?
   (b) How deficient is it?
   (c) How much muriate of potash is needed to overcome the deficiency?
   (d) Will it pay to use potash?

In other words, we knew we had potash-deficient soils; we knew that most of them were in the tight clay region in southern Illinois; and we knew that even within the tight clay region not all the soils were deficient, or at least not to the same extent. We also knew that in the dark-colored prairie soils some few were deficient and more were becoming so. We could make generalized recommendations for areas generally low in available potassium which could be considered practical because they were the best we knew how to make at that time, but we could

[1] Paper presented to the Illinois Agricultural Association, Chicago, November 18, 1943.

not make a sure-fire recommendation for any specific case. The farmers requiring 100 pounds of muriate of potash and those requiring only 50 pounds, or perhaps none at all, were receiving the same recommendation.

That was our potash problem in 1930.

In attacking this problem with soil chemistry, the first thing we did was to review the attacks made in the past.

Many years ago it had been theorized (not believed) that since nearly all Illinois soils contained large amounts of total potash, the return of potash-containing materials or fertilizers would not be necessary. It was theorized that perhaps the turning under of organic matter would make the large supply of soil potash sufficiently available. It is good science to theorize, but it is poor science to believe your theory without testing it. Testing this theory on the Illinois experiment fields over a period of 20 years had completely overthrown it. This theory has been discarded.

Another Theory

Another theory we had in the past was that soil fertility varied with the soil type and that if one knew the fertility requirements of one area of a given type, these requirements would hold for other areas of that type. It was hoped that, by putting experiment fields on different soil types, one could determine the deficiencies for the type and apply the findings to all the other areas of that type.

This theory worked out only slightly better. There are certain soil types which can be designated as generally, but not always, potash-deficient. The available potash level, as well as that of other nutrients, varies greatly within the type as well as between types and there was, at that time, no way of knowing whether or not the experiment field was located on an area which contained the available nutrients in the amounts found on most of the areas of that type.

This attack, therefore, did not solve the problem of applying the experiment field results to the particular soil being farmed by John Doe. This soil type is of help in generalizing for large groups of farmers. What is best for a large group as a whole may not be best for the individual whose problems are strictly his own. For the individual, the soil type cannot be considered a fertility unit to be treated alike with limestone, potash, and phosphate.

Now, let us get back to soil chemistry. In the early 1850's, Thomas Way, an English soil chemist, found that soils adsorb potassium on the surface of the clay particles. This is called the replaceable or exchangeable form. By 1930 this form was considered of importance in plant feeding, but it had not been proved that it was a direct measure of the potash requirement of a soil.

Our first attack at the problem was to study the replaceable potassium in the soils of our soil experiment fields.

We found that a good correlation was obtained between the amount of replaceable potassium in a soil and its need for potash. In general, soils containing less than 100 pounds per acre (2,000,000 pounds of soil) of replaceable potassium gave good responses to potash; soils testing between 100 and 150 pounds gave medium responses, mostly for corn and legumes; and soils between 150 and 200 pounds gave some response with corn but not with other crops.

In 1932, a soil test for replaceable potassium which gave the same results as the quantitative work was devised. This was adopted for extension use and was also applied to plant-tissue testing.[3]

However, it is what has been done with this test in the last year and a half that is the meat of this discussion. But before I get started on the meat course, I should rapidly mention the chemical studies of soil potash, made by the Soil Fertility Division of the Agronomy Department in the period since 1930, which help explain our new work.

We have studied the weathering of the potash minerals in the soil through all the stages of soil maturity represented in Illinois. We have found which potash minerals are of most importance. We have found that it is the weathering away of certain of these minerals which has caused our potash deficiencies. With the Geological Survey, we identified the most important potash mineral in Corn Belt soils and called it "illite," after the State of Illinois. We studied the adsorption of added potash by the colloidal clay minerals and its subsequent release to the plant when it was needed. We studied the rate of release of potash from the inside of the clay mineral to the available form; we studied the equilibrium between the replaceable potassium and the other replaceable bases and the influence of this on potassium availability. These and many other studies, including the analysis of the crops growing on these soils, form the background for the rest of my discussion.

[2] The Clay particles are very small, ranging from 1 25,000 of an inch down in size.

[3] See mimeograph AG 878, "Potassium, Phosphorus, and Other Tests for Illinois Soils," by R. H. Bray.

Recently, I made a new study of the correlation of our potash test with crop growth. Following a method of interpretation suggested by the German scientists, Mitscherlich and Baule, back in the early 1920's, I soon found myself in the midst of a highly interesting set of conclusions. They were so startling that I could hardly believe them, and I spent the next six months or so trying to shoot them full of holes. Part of these conclusions could have been predicted from the work of these German scientists; others are conclusions which do not agree with their original interpretations, but which put the whole study on a highly practical basis. I found that the new conclusions were sound and that they in turn were upsetting some of our old ideas about soil fertility.

I will not attempt to give the scientific background for these conclusions. It will be published in the journals devoted to this purpose. Instead I am going to devote myself entirely to the practical use to which these conclusions can be put.

The Soil-Test Value and the Per Cent Yield

Table 1, column 1, shows a set of soil-test values for available potassium.

TABLE 1. POTASH—TABLE OF VALUES FOR THE CALCULATION OF CROP YIELDS AND CROP INCREASES

Lbs. K/acre by test (available K)	Per Cent Yield* Corn legumes	Soy-beans	Wheat†
55	53	65	79
73	63	77	87
95	74	75	96
109	79	89	98
127	84	94	100
150	90	98	
182	95	100	
236	100		

* $\frac{\text{yield without added } K_2O}{\text{yield where K is not deficient}} \times 100 = \%$ yield or % K sufficiency.

† Oats and other small grains probably similar to wheat.

Let us take the first value for potassium, which is 55 pounds per acre, or 55 pounds in 2,000,000 pounds of soil. In the next three columns we have the per cent yield obtainable for the major crops grown in Illinois. Corn and legumes can grow 53 per cent of a crop on a soil which contains only 55 pounds of available potassium.

Now, just what do I mean when I say that corn will produce only 53 per cent of a crop on a soil testing 55 pounds of replaceable or available potassium per acre? I mean that that land is now producing, or will produce, only 53 per cent of the crop which it could produce if adequate but economical amounts of potash were applied. I mean that the yield with adequate potash is a 100 per cent yield and that this 100 per cent yield is used as the base for all percentage calculations used in this method of soil-test interpretation.

Practically speaking, for most soils and conditions in the Corn Belt, it takes as much replaceable potassium (55 pounds) to produce a 53 per cent yield of corn on a clay pan soil, deficient in phosphorus and giving a low yield in bushels per acre, as it does to produce a 53 per cent yield on a well-drained, friable silt loam, not deficient in phosphorous and giving a relatively high yield in bushels per acre. It also takes as much replaceable potassium (236 pounds per acre) to produce a 100 per cent yield of corn on the clay pan soil as it does on the well-drained loam even though the actual 100 per cent ceiling yields may vary between the two soils by as much as 50 bushels of corn. This means that the soil requirement is not directly related to the crop requirement and that they are two distinctly different values. The soil requirement is similar for similar per cent yields as just illustrated and as shown in Table 1. However, the crop requirement in terms of pounds per acre varies with the magnitude of the crop in bushels per acre. It is the fact that the soil requirement is similar for the same per cent yield which makes our new interpretation possible.

Now, let us get back to our first example. A 55-pound test permits a 53 per cent corn yield. This means that the use of adequate potash will almost double the yield, bringing it up to a 100 per cent yield. In our method of calculation this is a 47 per cent increase in yield, that is, the increase in yield is 47 per cent of the 100 per cent yield. If, with adequate potash, the yield is restricted to 40 bushels of corn by a shortage of other nutrients, or by the physical nature of the soil, these 40 bushels are considered a 100 per cent yield just as truly as if better conditions had permitted a yield of 80 or 100 bushels as the 100 per cent yield.

What about crops other than corn? Do they have the same potassium requirement? The answer is no, in fact they vary considerably in their soil requirement for potassium as shown in Table 1. A soil which can produce a 53 per cent crop of corn can, from the same amount of soil potassium, produce a 79 per cent crop of wheat or a 65 per cent crop of soybeans.

(Continued on page 22)

June Crop Report

During recent weeks growing conditions have been unusually favorable and in spite of a late and uneven start, national crop prospects now appear better than on this date in any of the last 10 years except 1942.

Grains

Owing chiefly to timely rains in the Southwest during May, the forecast of winter wheat production has been raised to 714,000,000 bushels, an increase of 52,000,000 bushels over prospects a month ago. As spring wheat appears to have been planted on a full acreage and to be growing under favorable conditions, the total wheat crop is likely to exceed a billion bushels and at present gives promise of being the largest ever harvested in the country. Many fields of oats were planted unusually late and not all of the intended acreage could be sown. In places some late fields of oats are just coming up while early sown fields are heading. Both acreage and yield are uncertain and a near-average oat crop of about 1,193,000,000 bushels is all that can be expected. Barley is less extensively grown in the area that has been too wet and production is expected to be about 300,000,000 bushels, a good-sized crop.

Corn prospects appear only fair. Planting has been late and there is still a considerable acreage to be planted, particularly in the wet acres of Minnesota, Iowa and Missouri, but the total acreage will be large and a record proportion will be planted with hybrid seed. Prospects for early hay crops are excellent and recent rains give assurance of a good crop of wild hay. Supplies of water for irrigation may be a little short for a full yield of late cuttings of alfalfa in Idaho and the Pacific Coast States but with no other unusual setbacks the total hay crop should be large, probably nearly 100,000,000 tons. This would be about as large a crop as was put up last year but no more than is needed for the large number of cattle to be fed.

The condition of pastures on June 1st was reported as 89, the highest condition for the date since 1922 and one reached only when growing conditions are favorable quite generally in the farming areas of the country. Reports on Western ranges on June 1st show a lack of rain in west Texas, southern New Mexico, parts of Arizona, much of California and Oregon, and portions of other Western States, but prospects for ranges now appear favorable from Colorado northward.

Not all fruits can be estimated this early in the season but conditions in the main fruit belts appear favorable and the total output seems likely to be of near-record proportions. Truck crops for market are being grown on fairly large acreages, production so far has been well above average, and prospects for late crops appear moderately favorable.

Corn

Crop prospects appear to vary sharply among areas and are by no means clear at this time. A month ago, after several months that seemed continuously wet and cold, most farmers in Central, Eastern and Southern States were far behind in the planting of spring-sown crops. After the first week of May there were some destructive late frosts but the weather permitted farmers to get into the fields and farm work went ahead with a rush. By mid-May corn planters were running in all States from Georgia to Montana; by the end of the month a large part of the corn crop had been planted and in early June late plantings and replantings were being completed rapidly except on some bottom lands that were still wet from overflows. On the first of June some oats and barley were still being sown in Northern States and some cotton was still being planted in the South.

In addition to reducing yield prospects by late planting the delay in field work has prevented carrying out earlier plans. Many farmers, who were unable to complete their original program before too late, have substituted crops which could be planted later. It is not yet possible to measure the shifts but some of them seem likely to be large. In Iowa farmers still had 4½ million acres of corn to plant on June 1st. They have been working night and day to prepare the land and to get every acre possible planted before too late but a few showers could materially affect their score. In Nebraska, where some areas had a fall too dry to sprout wheat and a spring too wet to permit oats to be sown, moisture conditions have recently been favorable and there are some indications that farmers may plant an extra million acres to corn. Farther south more of the shift is expected to be to grain sorghums. Farther north, it is expected that some millet, sudan, and other forage crops will be planted after it is too late for corn. Farther east, suitable kinds of corn and soybeans can still be planted and some grass lands will be left for hay.

In all the eastern half of the country there are sharp local differences in the progress of

(Continued on page 24)

Feeding Hungry Crops in War and Peace*

By CHARLES J. BRAND

Executive Secretary and Treasurer, The National Fertilizer Association, Washington, D. C.

(Continued from the previous issue)

In the foregoing discussion, I may have given the impression that only three elements—nitrogen, phosphorus, and potassium—are essential to crop growth. This, of course, is not the case. At least 14 of the 92 known chemical elements are necessary—oxygen, hydrogen, carbon, nitrogen, phosphorus, sulphur, potassium, iron, calcium, magnesium, manganese, copper, zinc, and boron. Oxygen comes from the air; hydrogen, from water; carbon, from the carbon dioxide of the air; nitrogen, from the soil and, in the case of legumes, from the air: the other ten, from the soil and from fertilizers. Mixed fertilizers commonly supply tremendous quantities of calcium and sulphur as necessary components of the materials which supply nitrogen, phosphorus, and potassium. A considerable quantity of magnesium gets into mixed fertilizers through the use of dolomitic limestone as a conditioner. Calcium, sulphur, and magnesium are just as essential to plant growth as nitrogen, phosphorus, and potassium, but are less frequently deficient in the soil. They are supplied to the farmer at little or no extra cost, and whatever benefits accrue from their use are in the nature of clear profit. Iron is so necessary in plant growth that no green coloring matter could be produced without it, but it is required in only minute quantities and is seldom deficient in the soil. Boron, manganese, copper, and zinc are also needed only in minute quantities by plants, but, when any one of them is lacking, crop growth is seriously retarded. These elements are now being included in mixed fertilizers wherever the soils are known to be deficient, but, under some conditions, it is found more desirable to apply them in connection with spray material, as for example in the production of citrus fruits in Florida and California.

Many of the symptoms of deficiency, both of the major and of the secondary and minor plant nutrients, were described and illustrated in *Hunger Signs in Crops*, a book published by our Association three years ago in cooperation with the American Society of Agronomy. The keen interest in plant nutrition among agricultural workers and farmers is indicated by the fact that our first edition of 14,000 copies, which sold at $2.50 a copy, is now practically exhausted and we are considering a reprint.

Industry Leads in Soil Conservation

No one can be more desirous of developing and obtaining a prosperous agriculture than the members of the fertilizer industry. The farmer is almost our only customer, for he buys at least 98 per cent of our products. I know that we have been charged with wanting to keep the farmer poor, so that, presumably, he would be dependent upon the use of fertilizer every year. Nothing could be much further from the truth, for obviously a sorry farmer is a sorry customer and conversely a good farmer—one who is prosperous—is a good customer. We are convinced that the good farmer—one who employs good methods of production—can use more fertilizer at a profit than one who is employing poor methods. For many years, we have advocated the growing and plowing under of cover crops, the improvement of pasture land, the liming of acid soils, the use of the best seeds, and good farming practices all the way around. We realize that fertilizer is only one of these good practices and that, if any of the others are neglected, the results will not be satisfactory.

Perhaps I can illustrate our attitude by mentioning the fact that during the past five years we have produced three motion pictures, several editions of each with regional adaptations, and these pictures during the past four years have been shown about 12,000 times to farm audiences totaling around 800,000 persons. One of these pictures emphasizes pasture improvement; another, more efficient application of fertilizers; and the third, the importance of organic matter.

We believe that, aside from the actual slope of the land, depletion of soil fertility is

the greatest cause of soil erosion; that proper use of land and fertilizers, along with proper terracing and contour farming, will go a long way towards stopping erosion losses. Certainly, not much can be done with a soil that is too poor even to grow good weeds.

During the past year, many people including a number of members of my industry have sent to me copies of a circular soliciting subscriptions to a magazine called *Organic Gardening*. Both the circular and the magazine include highly erroneous statements concerning the use of commercial fertilizer. For example, the statement is made that chemical fertilizers poison crops, making them unfit for human consumption. Such statements are absolutely untrue. But the uninformed believe them. Hence, they do harm by causing people, for instance, victory gardeners, to try to produce on unfertilized soil. They do a disservice to American agriculture.

Cotton plays such an important part in six of the States covered by this Southwest Regional Clinic that something special should be said about that crop. Colorado and Kansas produce none. But Arkansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas customarily make over 50 per cent of the United States' crop.

The Cotton Situation

No crop shows more clearly than the cotton crop the essentiality of commercial fertilizer. For many years a larger percentage of the fertilizer manufactured in the United States was used to make the cotton crop than any other crop. Even as recently as 1927 nearly 32 per cent of all fertilizer used was applied to that crop. By 1938, for a variety of causes, but mostly acreage reduction, the proportion used on cotton had dropped to less than 21 per cent. In the meantime the percentage applied to corn remained almost constant at close to 22½ per cent of the total fertilizer consumption. In 1938 the farmer who used fertilizer on his cotton obtained $4.47 in return for every dollar expended on fertilizer. The corn grower received $2.07. With relatively high wartime prices, returns are much higher. Obviously there is little difference in the erosion-promoting character of any two row crops like corn and cotton. One invites about as much erosion as the other.

Recently I read a report of a farm address in Alabama in which the speaker said:

"Cotton has been the curse of the South, because it is greedy, taking everything out of the soil and putting nothing back."

This is an unwise and inaccurate statement that should be corrected by those interested in our cotton economy and in the South.

So little fertilizer is used in Oklahoma that it does not serve for making comparisons. Hence to illustrate the diversity in rate of return, we may compare Georgia and Florida. Florida is noted for its fine climate, but it has a very infertile soil for the most part, except when properly fertilized. Unlike Iowa, neither State has much land that is rated "excellent" but Georgia has nearly three times as much "good" and "fair" soil as Florida. This difference expresses itself in an estimated per cent of total crop value produced by fertilizers in 1942 of 51 per cent in Georgia and 83 per cent in Florida. This is another way of saying that without commercial fertilizer Georgia would have made about half as big a crop and Florida would have made, roughly, 17 per cent of the crop that was produced in that year. There is no reason for thinking that in the long run there will be any lessening in the need to use fertilizers, not only in Georgia and Florida but throughout the world.

First of all, cotton is the most important cash crop grown in the United States. This is true despite the fact that corn usually occupies in the neighborhood of 100,000,000 acres, while in 1943 cotton occupied only 21,942,000 acres. What has happened to our cotton-farming economy in the last 15 years is well shown by the drastic reduction in acreage.

Average Acreage in Cotton

1925–1929	42,600,000 acres
1934–1939	34,658,000 acres
1938–1942	23,219,000 acres

The foregoing figures may well raise grave questions in the minds of thoughtful people as to the wisdom of some of our agricultural programs.

Approximately 13,500,000 of our people are directly dependent for a goodly part of their livelihood on the cotton crop. Fully 10,000,000 of these are on cotton-growing farms, and approximately 3,000,000 work in the cotton textile manufacturing plants of the country. About 10 per cent of our population is heavily dependent on cotton farming. About 2,000,000 out of more than 6,000,000 farms produce cotton in 17 different States.

The total value of the cotton lint produced in the country between 1900 and 1943 was $38,435,518,000. Total value of cottonseed and its derivatives for the same period was

about $7,000,000,000, making a total for 1900 to 1943 of more than $45,000,000,000.

So much for the value and economic importance of the cotton crop. Now for the statement that cotton takes everything out of the soil and puts nothing back. Obviously, in the sense that clovers, alfalfas, lespedezas, and other leguminous plants put nitrogen back into the soil, cotton, which is not a legume and does not have nitrogen-fixing bacteria attached to its roots and rootlets, makes no soil restoration. The same is true of corn, wheat, oats, and all other crops except only the leguminous family, and some of these draw more heavily upon the other plant-food resources of the soil than upon nitrogen. Assuming a rough equivalence between the production of one bale of cotton, 60 bushels of corn, and three tons of alfalfa, these three crops remove the following amounts of plant food:

Plant-food Removal by Certain Crops

Crop	Yield	Nitrogen lbs.	Phos. Acid lbs.	Potash lbs.	Total lbs.
Cotton and Cottonseed	1 bale	65	25	50	140
Corn.....	60 bu.	95	35	70	200
Alfalfa.....	3 tons	140	35	135	310

The cotton removes less than three-fourths as much plant food as the corn and less than one-half as much as the alfalfa.

The average United States production of cotton during the past five years was 249.6 pounds lint per acre; for the five years prior to that, 212.4; and for the five-year period 1929–33, only 183.8 pounds. Thus there has been an increase of 65.8 pounds lint per acre or 36 per cent in the past ten years. The 1943 average was 253.5 pounds, when the largest amount of fertilizer in history was used.

A useful and outstanding figure to carry in one's mind is that the most valuable cotton crop ever produced was made in 1919 on less than 33,000,000 acres of land, a small acreage for that period. The yield that year was low, less than 166 pounds per acre. The total production was only 11,411,000 bales. The farm value of the lint alone was $2,016,000,000. Of the total cash income of American agriculture that year, about $4,600,000,000, nearly one-seventh, was produced from cotton lint alone.

Our cotton crop for nearly a century and a half has clothed literally billions of people. While it has wrought some economic injustice to the grower, even that injustice has not been unmitigated. On the whole, our cotton has been a blessing not only to the South but to the United States and the world. Obviously, the statement that it is an unmitigated and outstanding soil robber, as indicated by the quotation given above, will not bear analysis.

Fertilizer Prices at Low Levels

I want to speak briefly about farm product and fertilizer prices and the income of farmers in relation to that of others. The best way to make these comparisons is by means of index numbers.

According to most recent indexes released by the Government, prices of all commodities at wholesale have an index number of 152; prices paid by farmers for the things that they require, 175; and farm products at the farm, 196. In this connection it is of interest to add that the index number of fertilizer prices stands at 121. In each case the index number 100 represents the average price for the same base period, namely, the parity years 1910–1914.

Many persons, at heart friendly to the farmer, are disposed to criticize him at this time, alleging profiteering on his part. This is manifestly unfair. Price indexes to show the relations of farm and other prices have been prepared and distributed by the Government covering in detail all of the years since 1890. In that period of 54 years, there have been only six years for which the index number of agricultural prices at the farm was higher than the index of all commodities. Certainly, it takes more than six swallows to make a summer, and if during the throes of two world wars farm prices were temporarily advantageous to the farmer, it is, to say the least, not sporting to begrudge them to him.

In closing, I want to refer with some introductory comments to an address that was given at the annual convention of our industry at Colorado Springs in June, 1930.

In the dim and distant but sane days of President Woodrow Wilson, there was a distinguished Assistant Secretary of Agriculture, as well as an Assistant Secretary of the Navy who in later days became very famous. You all know who the latter was, but may not recall the former. He was the Hon. Clarence Ousley, a native son of Lowndes County, Georgia, who served in the "Little Cabinet" during World War I under Dr. David Franklin Houston. In the 1880's Colonel Ousley moved to the great agricultural State of Texas where later he and Houston became good friends, and where he has spent nearly

(Continued on page 26)

Obituary

JOHN L. HEILIG

John L. Heilig, broker in fertilizer materials, died in Norfolk, Va., from a heart attack on June 1st. Mr. Heilig, who was 49 years of age, had been connected with the fertilizer business for many years. After being employed by the American Agricultural Chemical Co., the Synthetic Nitrogen Products Corp., and the Barrett Co., he opened his own brokerage office in Norfolk in 1932. The business will be continued by his family until the return of his son, Lt. George Heilig, who is serving in the Army Air Force.

CHARLES B. MITCHELL

The death of Charles B. Mitchell, vice-president of the Standard Wholesale Phosphate & Acid Works, Baltimore, occurred on June 7th, from a heart attack. Mr. Mitchell, who was 60 years of age, had been connected with the company for many years, serving as vice-president since 1921.

Increase in Nitrate of Soda Imports Urged

According to reports, the War Food Administration and the War Production Board has requested the War Shipping Administration to provide space for not less than 1,000,000 tons of nitrate of soda to be shipped from Chile to the United States during the 1944–1945 fertilizer year. In the year just ended, about 600,000 tons of Chilean nitrate was imported, which is about 100,000 tons more than the War Shipping Administration had definitely allotted at the beginning of the 1943–1944 fertilizer season.

The nitrogen program for the coming year calls for a minimum of 675,000 tons of nitrogen, of which Chilean nitrate would supply about 24 per cent. In scheduling deliveries, it is planned that all material would be delivered in United States ports by May 25, 1945.

Fertilizer Wages Increase

In the first quarter of this year there was an average of 25,900 wage earners on the payrolls of fertilizer plants, according to the U. S. Bureau of Labor Statistics. This represented an increase of about a fourth over the number of workers in the industry in the first quarter of 1939. In contrast to this 24 per cent increase in employment, there was a 73 per cent rise in payrolls between the two periods.

These and other interesting facts about employment and earnings of fertilizer plant employees are shown in the table below. The figures are based on statistics compiled and published by the Bureau of Labor Statistics. In order to put all of the items on a comparable basis, so that relative changes can be seen quickly and accurately, the data in each case are shown as percentages of the first quarter of 1939, the last pre-war year. Changes during the war period in this field of industry operations can be seen at a glance.

The increase in average weekly wages, from $13.15 in 1939 to $27.18 in 1944, is due in part to a rise in hours worked per week. More important, however, has been the sharp increase in hourly earnings.

An increase in weekly wages does not represent a comparable increase in the amount of goods and services which the worker can buy. The cost of living has also gone up, as everyone is well aware. But, as shown by the sixth item in the table, living costs have gone up less than a fourth since early 1939, while wages have doubled. The net result, as shown by the last line, is a rise of two-thirds in the purchasing power of the fertilizer workers' wages, or "real wages."

Fertilizer production has more than doubled since 1939, while man-hours worked have shown a somewhat smaller rise. Consequently there has been an increase in output per man-hour.

EMPLOYMENT AND WAGES IN THE FERTILIZER INDUSTRY AND THE COST OF LIVING
First Quarter of Each Year—1939 = 100

	1939	1940	1941	1942	1943	1944
Employment	100.0	102.9	100.3	123.6	124.6	123.6
Payrolls	100.0	109.4	115.9	176.9	226.9	273.4
Hours per week	100.0	97.8	100.4	108.4	117.7	121.7
Hourly earnings	100.0	107.8	112.2	128.4	149.8	169.5
Weekly wages	100.0	105.4	112.7	140.4	176.1	206.7
Cost of living	100.0	99.6	101.2	111.9	120.0	122.3
Purchasing power of weekly wages	100.0	105.8	111.4	125.5	146.7	169.0

IT MAY BE

By SAMUEL L. VEITCH

AGRICULTURE

The House adopted the Conference Report on the Agricultural Omnibus Bill including a provision extending the Federal Aid School Lunch Program for one year.

It may be the latter part of this year, Congress will pass the Crop Insurance (Fulmer Bill H. R. 4911) Bill which includes cotton, wheat and flax. This bill does not call for a subsidy. Anyone interested in this subject should follow the bill closely.

Recently several agricultural information services have started. They are called Washington Farmletter, Spade and Washington Report. Yearly subscription rate very reasonable, too.

It may be that John L. Lewis will try to organize farm labor. His chances of success are slim. He was not successful in organizing the dairy workers.

FEDERAL AGENCIES

By the decisive vote of 282 to 46 the House voted to abolish all Federal Agencies set up by executive order unless such bureaus have been recognized by Congress through direct appropriation or other legislation. This proviso has already been approved by Senate so it is sure to become a law unless vetoed by the President. And, of course, this could happen.

INVASION

It may be the German Army will take a beating on battlefields in France. If you see this happening, you had better run for cover and make hasty preparations to start production of goods for civilian use, as the show should soon be over. The next 60 to 90 days should determine whether the European War will end this fall (or maybe sooner) or run over into 1945. Although not publicly expressed, the Army is confident it will blast Germany out of the war and into peace terms before the end of the year.

The German Military heads being realists may overthrow the Nazi regime, if they see the end of the road in sight and immediately start negotiations to sue for peace.

TAXES

Many people feel there will be some tax relief after Germany folds up. There seems no probability of this until after the Japanese have been properly massaged at the seat of their pants. Even then, it is doubtful if individual incomes will find much relief. Can you imagine the rumpus that will be set up by discharged members of the armed forces when they return to private industry and learn the amount of tax levelled against their incomes? It is going to be hard to convince them they are not paying for the war they fought. And from this other drastic developments may occur.

SALE OF WAR SURPLUSES

Although surplus consumer goods are now small, it should increase rapidly as the invasion gets further along. The Treasury is formulating a plan for disposal. The breakdown will be something like this. Lot sizes small enough to appeal to even small dealers. Grouping possible buyers such as jobbers, dealers, etc. Sales to be tried on negotiated basis at first, followed later by auctions. To circularize business men advising various types of materials for sale.

RATIONING

It may be OPA has run into trouble on ending rationing of most meats and canned goods. They believe a great amount of hoarding is going on. How to cope with this is their big problem. Putting them back on rationing again may be the answer.

LABOR

It may be that the President got himself in the middle with the railroad brotherhoods, by promising to arbitrate their wage dispute if they would also allow him to arbitrate their vacation pay dispute. Some of the unions agreed and some did not. Now the unions consenting want something done about the vacation pay. The President's answer is, that he is "too busy," doesn't set so well. Seems the issue developed into a "hot potato." In order to dig out from under, the President has turned the matter over to the Mediation Board—so this again throws open the issue which labor does not like. To even matters with the President for sticking his thumb in the pie, the unions threatened to fight his first choice for Leiserson's job on the Board, causing him to make a second choice, and from there the fight will continue.

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Farmers Urged to Continue Early Fertilizer Buying

The War Food Administration commended farmers for buying and accepting delivery of their fertilizers early and urged them to continue the practice. P. H. Groggins, Chief of the Chemicals and Fertilizers Branch, Office of Materials and Facilities, stated:

"During the 12 months just ended the fertilizer plants of the country have delivered to farmers the largest tonnage of commercial fertilizers and fertilizer materials in the Nation's history. This will help produce the great volume of crops we need.

"Without the cooperation of farmers in taking delivery of fertilizer before they needed it, the fertilizer industry could not have moved nearly so much fertilizer. There would have been a critical shortage on farms.

"Normally, the movement of fertilizer is crowded into a few months each year. During the peak movement, the fertilizer manufacturing plants have usually had to double and treble the number of employees. In wartime this is impossible.

"The War Food Administration called on farmers to accept delivery of their fertilizers at times when the manufacturing plants could make the delivery, and to store it in their barns and sheds for use when needed. They have come through in a fine way.

"Records show that from October, 1939, to January, 1940, farmers took 18 per cent of their yearly requirements; during the corresponding period in 1943–44 they accepted delivery of 37 per cent. The annual consumption of mixed fertilizers had increased from about 5½ million tons in 1939–40 to an estimated total of 7¾ million tons in 1943–44."

Mr. Groggins indicated, however, that the problem of distribution continues to be critical. Concerning this problem he said:

"Although the WFA has been successful in arranging for the production and importation of enough fertilizer materials to meet our requirements in the year ahead, farmers will get the supplies they need only if the fertilizers are produced, packaged, and shipped on time. The individual farmer can assure himself of sufficient fertilizer for his own needs by placing his orders as far as possible ahead of the season of use. If all farmers will do this, plants can be kept working at the capacity permitted by available labor. Continued maximum production and use of fertilizers are necessary in support of the war food program."

Chile Favors Open Competition

In a letter to the editor of the New York *Times*, published on May 28th, Hernan Videla, a Senator of the Republic of Chile, denied the truth of a recent news dispatch that Chileans were fearful of the competition from synthetic products developed recently in the United States. According to Senator Videla, the only rivalry they object to is from products manufactured by Government-owned plants in the various American republics. Senator Videla's letter is as follows:

TO THE EDITOR OF THE NEW YORK TIMES:

On May 16th the New York *Times* carried a dispatch from Santiago, Chile, stating that Chileans saw a threat to their country's economy in the production of competing synthetic products in the United States. As chairman of the Chilean delegation to the Conference of Inter-American Development Commissions, I should like to make clear that Chile does not and should not object to competition by private enterprise but is concerned only with the threat of competition from Government-owned plants. This is a problem with which your own citizens are, I believe, equally concerned.

The two major industries of Chile, upon which the economy of the country largely depends, are copper and nitrate. For many years prior to the war there has been in the United States a prohibitive tax on foreign copper, but Chilean nitrate has for many years competed successfully with synthetic products in the United States' market and elsewhere. We are prepared to continue that competition most energetically. Obviously, however, we would be unable to survive against the competition of Government-owned plants.

Attitude Defined

The Conference of Inter-American Development Commissions, which ended May 18th, adopted unanimously a resolution which so completely defines the attitude of the American republics toward this question of Government competition that I quote it herein:

1. That synthetic substitutes which displace or tend to displace the consumption of natural products available in American countries be produced by the American Governments themselves only when indispensable to the national defense and when their requirements cannot be effectively met by natural products;

2. That the American Governments should not foster the construction or operation, within or outside of the Americas, of synthetic products which compete with natural products available in American countries except when indispensable to the national defense and when their requirements cannot be effectively met by natural products;

3. That the Government plants of this nature already in existence, either in or outside the Americas, if not dismantled or put to other uses or held in reserve in the interest of national defense, should not be given away to private interests; but that if these plants are sold or leased, the prices and conditions should be such as not to constitute either directly or indirectly a subsidy in favor of the purchaser or lessee, or in any way represent an advantage to the purchaser or lessee over private interests engaged in the development of the natural resources of the soil and subsoil of the American nations; and

4. That as soon as possible the Inter-American Financial and Economic Advisory Committee, or the appropriate constitutional authority or authorities, formally submit this resolution to the American republics with the recommendation that, in conformity with their own legislation, they give the foregoing declarations the validity of a multilateral treaty or an Inter-American commitment.

Step Forward

The citizens of your country are, I know, great believers in competition. So are the citizens of Chile. The producers of natural nitrate of soda in Chile, all of them operating privately, are making renewed efforts to reduce the cost of production and transportation, as well as to develop by-products. Within a few months a new modern plant, costing several millions of dollars, will begin production, on a lower-cost basis, and we are developing port facilities so as to reduce the time and cost of loading vessels.

This is the kind of competition which I think all the republics, including the United States, wish to encourage.

On behalf of the delegation from Chile, which I represent, I wish to express my appreciation of the leadership of Nelson A. Rockefeller as chairman of the conference, and of Rafael de Oreamuno, who so ably assisted him as vice-chairman. By its frank discussion of economic problems and of methods for the promotion of trade, the conference

will, I believe, lead not only to a better relationship among the republics but to a higher standard of living for all of them. We have taken a long step forward in the development of the kind of world which we would like to have after the war.

HERNAN VIDELA,
Senator, Republic of Chile.
New York, May 23, 1944.

May Tax Tag Sales

Fertilizer tax tag sales in the 17 reporting States in May represented 454,000 tons, compared with 448,000 tons a year ago and 330,000 tons two years ago.

Eight of the twelve Southern States reported larger sales in May this year than last. Declines were reported by the other four, with a particularly sharp drop taking place in Alabama. The net result was a decrease of 11,040 tons from last year for the region as a whole. Increases were registered by four of the five Midwestern States.

Total sales in the first five months of the year were 152,200 tons smaller than in the corresponding period of 1943 and were 429,881 tons larger than in 1942.

As has been pointed out previously, tax tag sales during the spring months have reflected the earlier buying this year. Tag sales in last November and December, representing almost entirely 1944 business, were 574,000 tons larger than in the corresponding months of the previous year. Sales from July through May amounted to 7,393,000 tons this year, compared with 6,619,000 tons last year and 5,779,000 tons two years ago.

FERTILIZER TAX TAG SALES

STATE	MAY				JANUARY–MAY		
	1944	1943	1942	%	1944	1943	1942
	Tons	Tons	Tons	1943	Tons	Tons	Tons
Virginia	35,072	36,459	25,491	101	314,405	310,182	305,482
North Carolina	92,087	83,651	47,720	97	1,031,159	1,062,646	996,122
South Carolina	37,836	37,143	28,890	90	613,867	683,038	577,234
Georgia	46,786	40,067	31,440	97	818,909	844,781	707,212
Florida	81,978	66,248	68,329	111	415,454	374,618	335,272
Alabama	9,150	41,700	23,950	89	540,400	610,500	537,150
Mississippi	15,522	33,431	19,925	89	287,826	325,167	269,390
Tennessee	33,025	26,183	16,460	109	196,468	180,222	137,770
Arkansas	7,600	4,570	10,150	68	94,583	140,055	125,550
Louisiana	7,550	5,075	8,500	93	131,635	142,138	128,786
Texas	9,000	12,380	6,355	104	130,905	125,610	106,088
Oklahoma	600	339	415	75	11,151	14,910	7,311
Total South	376,206	387.246	287,625	95	4,586,762	4,813,868	4,233,367
Indiana	24,737	33,675	16,062	76	174,474	230,800	236,503
Illinois	19,600	11,680	6,644	143	93,730	65,414	62,273
Kentucky	28,623	14,200	19,325	160	170,197	106,203	114,571
Missouri	4,764	1,072	281	163	70,629	43,418	32,934
Kansas	525	.....	5	456	15,001	3,290	1,264
Total Midwest	78,249	60,627	42,317	117	524,031	449,125	447,545
Grand Total	454,455	447,873	329,942	97	5,110,793	5,262,993	4,680,912

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FERTILIZER MATERIALS MARKET

NEW YORK

Buyers Feel Sure of Sulphate of Ammonia Supplies and Are Slow to Take Allotments. Potash Contracts Being Placed. Superphosphate Production Increasing but Deliveries Curtailed by Labor Shortage.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, June 14, 1944.

Sulphate of Ammonia

Many of the buyers have placed their orders for sulphate of ammonia under the allocations as given to them, but in most cases there has been no rush as buyers evidently feel that the material as allocated will be made available to them.

Potash

Definite allocations have now been issued to fertilizer manufacturers for delivery of potash June 1, 1944, through March, 1945, the fourth period. The buyers immediately started to place their orders and we believe that before long all allocated quantities will have been booked.

Superphosphate

Production seems to be increasing somewhat but movement continues steady so that no stockpiles are accumulated. In some instances, delivery has been curtailed due to labor shortage. With the anticipated movement of high-test material against Lend-Lease requirements, there will surely be a shortage of this material in this country. Anticipated quantities available for domestic manufacturers for the balance of this year have been fully contracted for; deliveries against these contracts should be maintained unless the labor situation becomes worse or anticipated requirements for export are increased.

BALTIMORE

Market Enters Summer Lull. No Fertilizer Organics Being Offered. Restrictions on Burlap Bags Lifted But Little Activity Reported.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, June 13, 1944.

There has been no change in conditions since last report, and the market remains quiet as is usual at this time of the year.

Ammoniates.—The market on organics remains unchanged and what domestic material is to be had is being bought by the feed trade, with practically none available for fertilizer use.

Castor Meal.—There are no large stocks of this material in the hands of producers, and no offering on the market, with manufacturers sold up to the end of the year and not quoting beyond that time.

Fish Scrap.—This material is still scarce as a fertilizer material. No sales reported.

Sulphate of Ammonia.—The market remains unchanged on this commodity, deliveries still being allocated.

Nitrate of Soda.—There has been no change since last report, except active demand for top dressing.

Superphosphate.—Ceiling price of 64 cents per unit of A. P. A., in bulk, for run-of-pile, f. o. b. Baltimore, still remains in effect, with manufacturers not taking on any new business but supplying customers who booked contracts some time ago.

Potash.—The market remains unchanged since last report.

Bone Meal.—Offerings of both raw and steamed bone meal remain scarce with no apparent relief in sight.

Bags.—There is no change since last report, and although restrictions on burlap for fertilizer bags have been lifted, there has been very little activity in the market.

CHARLESTON

Organic Materials Scarce and Priced Above Fertilizer Levels. Big Increase in Soya Cake and Meal for Feed Use.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, June 12, 1944.

Organics.—These continue scarce. Some limited allocations of nitrogenous based on 80 per cent of the base have been made.

Bone Meal.—This material is very scarce

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and no foreign material has arrived recent.y.

Blood.—The market remains for the domestic product at $5.53 per unit of ammonia ($6.72 per unit N) f. o. b. Chicago. The fertilizer buyers continue out of the market.

Oil Meals.—It has just been announced that in the season just past there was a total production of 2,791,316 tons of soya cake and meal, about 477,000 tons more than for the same period last year, but unfortunately most of this material has gone to feed.

TENNESSEE PHOSPHATE

Production of Lump Furnace Rock Dwindling. Victor Chemical Strike Settled. Shipments of Rock Continuing at Top Levels.

COLUMBIA, TENN., June 11, 1944.

Two weeks practically entirely without rain has again put farm work and outside mine activities almost even with the season, though it is unprecedented to see wheat and small grain harvesting well on the way to completion while corn is still being planted and tobacco not yet all set. Visitors interested in seeing the various stages of growth of the crops grown in this section will be able shortly to see all the major crops in all steps from an inch or so out of the ground to well into early stages of harvest. Some corn that usually gets into full tasseling stage just as the July and August shortage of rainfall cuts it from looking like a hundred bushels down to the yield from thirty-five to fifty bushels will have a chance to demonstrate whether late planting might help.

The market for lump phosphate for the blast furnace trade has entirely disappeared, as practically all producers are getting little if any lump from the deposits now working and the small amount produced is all being crushed with the run-of-plant fines. In some cases this is to better the grade, and in the rest simply to get the enormous tonnage being called by the customers for manufacture of super and chemical phosphate and for grinding for the direct application trade.

Some furnaces, which have depended on lump rock from Tennessee for the comparatively small and intermittent demand which they could always easily get from this field, are now in a bad situation as, of course, producers cannot hold special material now for incidental calls, when their regular tonnage trade demands more than they can produce. With the ceiling prices prevailing, it is impossible in the present manpower shortage to get hand-mined lump as all the hand labor can get work at far more remunerative wages than they could make producing lump for the furnace trade in which they used to supply a large amount.

The Jackson estate has recently sold a nearby tract of phosphate land to the Armour Fertilizer Works, the recorded price being given as $40,000. This land was purchased by C. S. Jackson many years ago for $10,000 as ordinary farmland, and has been optioned and prospected by a number of interests, including the present purchasers, a great many times. There are about 125 acres of land.

The strike at the Victor Chemical Works, which lasted four days, including D-day, was ended by the men finally obeying the union orders to return to work. No concessions were made and the cause of the strike, the disciplining of a switchman for carelessness in handling one of the cars for transporting elementary phosphorus, has been referred to proper authorities for settlement. The men appeared to think that, as the car was empty, discipline of a seven-day layoff was too severe, or unwarranted. Some day when the same kind of carelessness brings about the same accident to one of these cars loaded with 60,000 pounds of this material, which bursts into flame when the air touches it, the

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proper penalty then to be applied will be difficult to conceive. Such a thing as striking, with the boys on the beaches of France and in all parts of the world, had little public sympathy.

Shipments to both manufacturers and to farmers for direct application continue at top rate of production, limited still by inadequate manpower to about 75 per cent of possible tonnage from installed equipment on the average. Ground material requiring bagging and hand loading suffers a much larger deficit from this cause.

Use of war prisoners from Lawrence County, which was hoped to help this situation, has not materialized so far, as no provision for transportation is made or allowed for by local authorities.

The alfalfa field on the highway between Mt. Pleasant and Columbia, which was treated with a heavy application of ground phosphate rock the year before last and caused so much attention from its four fine crops last year, has already yielded two magnificent cuttings, the second on June 7th, and is generally acknowledged as the best field of alfalfa in the county.

CHICAGO

Fertilizer Organic Market Quiet. Buyers Asking for Offerings. Feed Mixers Asking for Price Concessions.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, June 12, 1944.

The organic market hit doldrums again the past fortnight, as practically no trading to fertilizer manufacturers was reported. Requests for offerings continue plentiful in the market and it looks as though a decided shortage of organics exists.

Ceiling prices in feed materials are maintained, though some mixers are asking for slight price concessions. Livestock receipts have been heavy, but labor has been the chief obstacle in producers keeping abreast of the demand.

Ceiling prices are well maintained:

High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.38 ($6.54 per unit N); dry rendered tankage, $1.21 per unit of protein, Chicago basis.

Jeffries To Head WFA Fertilizer Requirements Section

Thomas L. Jeffries has been appointed chief of the Fertilizer Requirements Section, Chemicals and Fertilizer Branch, War Food Administration. He succeeds William F. Watkins, whose resignation was recently announced. Mr. Jeffries was formerly connected with the Chilean Nitrate Sales Corporation, and has been serving WFA as Field Service Representative in South Carolina.

CLASSIFIED ADVERTISEMENTS

Advertisements for sale of plants, machinery, etc., and for help and employment, in this column, same type as now used, 60 cents per line, each insertion.

HELP WANTED

FOREMAN for fertilizer plant in Baltimore area. Must have experience in shipping, batching, etc. and must be able to produce results. Good pay. Address "620" care THE AMERICAN FERTILIZER, Philadelphia.

MACHINERY FOR SALE

ONE (1) Stedman Model C, 6 x 4 ft., rotary type Batch Mixer, including discharge hood, in good condition. Will sell for $1,000, f. o. b. Chicago. Riverdale Products Co., 75 E. Wacker Drive, Chicago, Ill.

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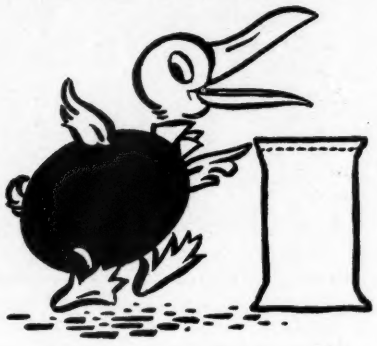
Trade Mark Registered

MAGNESIUM LIMESTONE
"It's a Dolomite"
American Limestone Company
Knoxville, Tenn.

FIVE GOOD REASONS WHY

BEMIS WATERPROOF BAGS

are replacing other containers for many products



Manufacturers of powdered, granular, crystal and lump form products have learned that Bemis Waterproof Bags are not only equal to other types of containers in many important points—such as ease of handling and filling, protection against contamination, dirt and sifting—but also provide these five special advantages:

1. First cost is less.
2. They save valuable storage space, whether empty or filled.
3. They reduce shipping costs.
4. They give full protection against absorption or loss of moisture or odors.
5. They release other essential materials for military and industrial use.

If Bemis Waterproof Bags are adaptable to any of your products, you, too, can enjoy these advantages. It's certainly worth looking into.

Mail the coupon today for the interesting booklet—"A Guide to More Efficient Shipping." Further, if you wish, one of our representatives will, without obligation, call on you to discuss your packaging requirements.

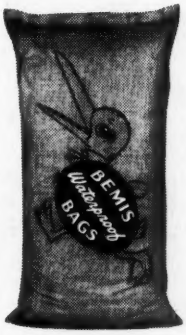
Here's How You Know What They'll Do

The performance of Bemis Waterproof Bags in use is pretty well guaranteed in advance by the Bemis Shipping Research Laboratory which...

1. Determines the proper bag structure for your job, considering the commodity, the packing, shipping, handling conditions, etc. Specifies what paper or combination of papers should be bonded to the tough, closely woven outer fabric and what type of adhesive should be used.

2. Keeps a constant check on the materials from which Bemis Waterproof Bags are constructed to make sure they match the specifications.

You can rely on the Bemis Shipping Research Laboratory's OK.



WATERPROOF DEPARTMENT

BEMIS BRO. BAG CO.

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Please send your special booklet, "A Guide to More Efficient Shipping," and details about use of Bemis Waterproof Bags for _____ (PRODUCT)

Firm Name _____

Street Address _____

City _____ *State* _____

Mark for the attention of _____

Maine Fertilizer Conference

It has been arranged to hold the annual summer fertilizer conference in Maine on August 1st and 2nd, at Presque Isle, Maine. Sessions will be held in the afternoon and evening of August 1st in the Northeastland Hotel, and on August 2nd there will be a trip to the experimental farm of the Maine Experimental Station.

Urea Material for Cattle Feed Introduced

A new material containing urea, designed especially to supply some of the crude protein equivalent in mixed feeds for cattle and sheep, is now being allocated to feed manufacturers, the Du Font Company has announced.

This new product, which has been given the name "Two-Sixty-Two" Feed Compound, can effectively replace part of the hard-to-get protein supplements, such as linseed meal, in the ration of ruminants. In fact, the War Production Board has for some months been allocating crystal urea to manufacturers for inclusion in their feeds for ruminants, thus aiding considerably in the solution of the critical wartime feed problems created by acute shortages of the usual protein supplements.

Numerous experiments as well as practical feeding experience have demonstrated the efficiency of urea for this purpose. Because crystal urea tends to take up moisture and subsequently dry out into a hard mass, difficult to handle, the Du Pont Ammonia Department has conducted considerable research in its own laboratories to develop a special free-flowing urea-base feed compound for exclusive use in feeds for ruminants.

"Two-Sixty-Two" feed compound gets its name from the fact that it supplies 262 per cent crude protein equivalent. Every pound therefore has nitrogen equivalent to 2.62 pounds of crude protein. The new feed compound has a light gray color and free-flowing characteristics. It is therefore easy to handle and mix with other feed ingredients.

Livestock nutritionists explain that urea is not used directly, but is rapidly changed to ammonia in the paunch or rumen of the animal. This ammonia is then used by the micro-organisms growing in the feed mass within the rumen. The protein produced by these micro-organisms is later utilized by the ruminant. That is also why urea in the feed of non-ruminants such as horses, swine, and poultry, is of no value.

The Potash Problem in Illinois

(Continued from page 7)

Again, Table 1 shows that a soil containing 109 pounds of available potassium by test can produce a 79 per cent crop of corn (or legumes), an 89 per cent crop of soybeans, or a 98 per cent crop of wheat.

Now, what are the limitations to the practical application of these facts? Will the indicated increases always be obtained? The answer is yes, provided we apply our facts in the same way in which they were obtained. These results are based on the average yields for several seasons. Legumes for supplying nitrogen were grown in the rotation and crop residues were returned. This means that, for average conditions, the amount of rainfall and the nitrates supplied by the soil and the legumes have been adequate for all increases resulting from potash additions.

On the other hand, phosphorous may or may not be deficient. This will not interfere with the potash test interpretation. If, therefore, a 70 per cent potash sufficiency exists, the average yields in the future with adequate potash use will be 100 per cent, or 30 per cent higher than they would have been without potash, although the actual yields with or without potash will be relatively lower on the phosphorous-deficient soil.

These facts were obtained on silt and clay loam soils similar in chemical nature to most of the soils of the Corn Belt. Sand soils, "slick spot" conditions, peats, mucks, and alkali spots represent further variations in soil conditions and may require a slightly different interpretation. Except for such limitations, the results are applicable generally for Corn Belt conditions.

(To be continued in the next issue)

STEDMAN
FERTILIZER PLANT
EQUIPMENT

DEPENDABLE FOR MORE THAN FIFTY YEARS

All-Steel Self-Contained Fertilizer Mixing Units
Swing Hammer and Cage Type Tailings Pulverizers
Batch Mixers—Dry Batching
Pan Mixers—Wet Mixing
Vibrating Screens
Dust Weigh Hoppers
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Founded 1834

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Fertilizer plants all over the country—large and small—state their needs and we meet them. Large stocks of seasoned materials and ample modern production facilities enable us to make prompt shipments.

TRIPLE SUPERPHOSPHATE

46 to 48% Available Phosphoric Acid

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We also manufacture
HIGH-GRADE SUPERPHOSPHATE

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A Mark of FLORIDA TRIPLE PHOSPHATE *Reliability*

SPECIFY
THREE ELEPHANT
BORAX

REG. U.S. PAT. OFF. REG. U.S. PAT. OFF.

. . . . WHEN BORON IS NEEDED TO CORRECT A DEFICIENCY OF THIS IMPORTANT SECONDARY ELEMENT

Agricultural authorities have shown that a lack of Boron in the soil can result in deficiency diseases which seriously impair the yield and quality of crops.

When Boron deficiencies are found, follow the recommendations of local County Agents or State Experiment Stations.

Information and references available on request.

AMERICAN POTASH & CHEMICAL CORPORATION
122 East 42nd ST., NEW YORK CITY

Pioneer Producers of Muriate of Potash in America

See Page 4

June Crop Report

(Continued from page 8)

farm work. In some areas, where the rains were not too frequent and where most of the farms are mechanized, the more efficient family units have accomplished an unprecedented amount of work and are nearly up to schedule. On the other hand, in many localities frequent rains during May have prevented completion of the intended plowing and planting and the need to cultivate crops already planted and to start haying and harvesting will cause some fields to be left untilled. The present indications are that in the better farming sections the good land, except some bottom lands flooded recently, will nearly all be planted. But where small or unproductive farms compete with booming war industries there has been some consolidation of farms and an increase in part-time farming; and there is much complaint that few are left to work on the farms except old men, boys, and others whom urban industries class as "unemployables." In these areas many a white-haired farmer reports that he is doing all he can but under present conditions the whole job cannot be done.

Contrasts are sharp and they color local opinions. From a national point of view the outstanding fact is that most crops are now planted and growing conditions are good. There are a few areas where crops are reported poor but they are quite limited and mostly where substantial recovery is still possible. In California and the Southwest there are some dry spots; more rain is needed for small grains and ranges in the Pacific Northwest but elsewhere most of the main cropping areas of the western half of the country now have a good reserve of soil moisture and hopes are rising. Crops in the South were planted late and large areas have suffered from too much rain but there is still time for good crops. In the central wet area extending from central Minnesota to central Missouri, there is less time to spare but farmers seem to have been catching up rapidly since June 1st. In the eastern Corn Belt planting was late but most areas are now only a little behind normal. An area stretching along the Atlantic Coast from North Carolina to Maine is urgently in need of rain but the strip is only a few counties deep. On the whole, comparing with the difficulties faced at this season in other years, a good crop year seems to be in the making.

Truck Crops

The June 1st pattern of progress of commercial truck crops for the fresh market was somewhat irregular but most late spring and summer producing areas show a net improvement over a month ago. Warm, drier weather in May permitted growers to clean fields of weeds and to cultivate fields which previously had been too wet. Truck crops made considerable progress although most crops are still one to two weeks later than usual.

As the spring season draws to a close it appears that acreage for spring harvest was 20 per cent greater than in 1943 and 6 per cent above average. Total tonnage produced on this acreage is placed at 1,694,000 which is 15 per cent larger than last year, 12 per cent above average and exceeds the previous record production by 8 per cent. Acreage of truck crops for the summer market probably will show about the same percentage increase as the acreage for spring harvest but may be slightly below average. Summer acreages estimated to date show the following increases over last year's acreage: watermelons, 43 per cent; onions, 34 per cent; green peppers, 33 per cent; cantaloupes, 26 per cent; green peas, 10 per cent; cucumbers, 9 per cent; celery, 8 per cent; snap beans, 4 per cent; and cabbage, 4 per cent.

Fertilizer Machinery *AND* Acidulating Equipment

BATCH MIXERS — PULVERIZERS — CAGE MILLS — SCREENS — SCALES
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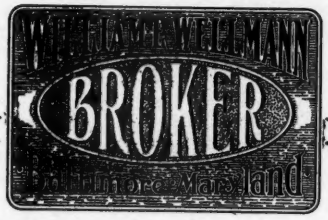

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Blood and Fertilizer Tankage
Phosphate Rock
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Manganese Sulphate
SOUTH AMERICAN DRY RENDERED TANKAGE

PEOPLES OFFICE BUILDING
Charleston, S. C.

Decreases in acreage ranging from 1 to 17 per cent are indicated for tomatoes, beets, carrots, and lettuce. Indicated tonnage from early summer acreage is 21 per cent larger than in 1943 and is 7 per cent above the 10-year average.

Field preparations for important processing vegetables were delayed early in May by excessive rainfall. But rains were less frequent after the middle of the month and temperatures began to rise so that growers in most parts of the country were enabled to proceed with outside field work. Considerable progress was made in planting snap beans, sweet corn, tomatoes and other late-maturing crops. Even in Maine, progress in planting some of these vegetables was farther advanced by June 1st than usual but the season was rather backward in Oregon and Washington.

Difficulties encountered early in May in preparing the land contributed to the slight reduction in the 1944 acreage of green peas, which preliminary estimates place at 482,150 acres compared with 483,260 acres planted in 1943. But the June 1st condition of the crop on this acreage was fairly favorable except in Delaware, Maryland and Virginia. Dry weather reduced the prospective tonnage in this area.

Growers of snap beans and sweet corn for processing expect to complete the planting of these crops by the middle of June. Conditions were favorable for setting tomato plants in the fields. Growers in some areas found it difficult to obtain an adequate supply of plants. After June 1st, growers in the northern part of the United States will turn their attention to planting lima beans, beets for canning, cucumbers for pickles and kraut cabbage.

Fruits

June 1st conditions indicate deciduous fruit production in 1944 may be above 1943 by as much as 22 per cent and about 7 per cent above average. The peach crop is indicated to be 17 per cent above average and about 60 per cent more than the short 1943 crop. Pear production is 3 per cent below average. Cherry prospects are 27 per cent above average and 69 per cent above the short 1943 crop. Condition of commercial apples is 10 points above June 1, 1943, indicating a somewhat larger crop than harvested in 1943. Grape production probably will not be as large as in 1943. Citrus fruit produced from the bloom of 1943 includes record crops of oranges and grapefruit and a moderate-sized crop of lemons, which have been moving to market since the fall of 1943 and will continue to move until the fall of 1944. Prospects are now favorable for good crops of citrus fruits from this year's bloom for market supplies beginning next fall.

Feeding Hungry Crops in War and Peace

(Continued from page 11)

all of his adult life. He is scholar, journalist, agrarian leader, administrator, and sound exponent of true democratic principles.

Colonel Ousley's address, to which I refer, was made several years before the constructive work of the Soil Erosion Service was organized under the effective, crusading leadership of Dr. Hugh H. Bennett. It was entitled "The Farmer's Place in Our Civilization." It received wide distribution at the time of its delivery, but has not since received the attention it deserves. I wish, therefore, to conclude my talk today with a quotation from this great native of Georgia:

Our Duty to the Earth

"I always contemplate the earth with reverence. I like the phrase, 'Mother Earth'—the source of all our sustenance, the storehouse of all our supplies, our raiment, our shelter, the pathway of our feet, the final resting place of our worn-out bodies. And of all its elements and attributes the soil seems to me to be the most appealing and vital, and I cannot but regard its depletion as vandalism and sacrilege. The good God gave us but one soil, and He gave it for the use of His children to the end of time. We are but His trustees in the occupancy and preservation of the estate of all posterity. If we despoil it, if we fail to maintain it, if we leave it less fruitful than we received it we are unfaithful trustees, and I feel that in the sight of God we are as culpable as if we robbed the estate of orphan children of whom we were made guardians by decree of court."

SACKETT EQUIPMENT
for the Fertilizer Plant
BATCH MIXERS • PULVERIZERS
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CONTINUOUS AMMONIATING EQUIPMENT
BASING, MIXING & BAGGING UNITS
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He won't dodge this-

Don't *you* dodge this!

The kid'll be right there when his C.O. finally gives the signal . . .

There'll be no time to think of better things to do with his life. *The kid's giving all he's got, now!*

We've got to do the same. This is the time for us to throw in everything *we've* got.

This is the time to dig out that *extra* hundred bucks and spend it for Invasion Bonds.

Or make it $200. Or $1000. Or $1,000,000. There's no ceiling on this one!

Make no mistake! The 5th War Loan is the biggest, the most vitally important financial effort of this whole war!

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Back the Attack! - BUY MORE THAN BEFORE

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For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
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AMMONIA LIQUOR
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Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

AUTOMATIC ELEVATOR TAKEUPS
Sackett & Sons Co., The A. J., Baltimore, Md.

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Sackett & Sons Co., The A. J., Baltimore, Md.

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St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill.
Union Bag & Paper Corporation, New York City.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
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BAGS—Paper
Bagpak, Inc., New York City
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BAGS (Waterproof)—Manufacturers
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Stedman's Foundry and Mach. Works, Aurora, Ind

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers. see page 33

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Link-Belt Company, Philadelphia, Chicago.

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Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DRYERS—Direct Heat
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
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Sackett & Sons Co., The A. J., Baltimore, Md.

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Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Company, New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Company, Columbus, Ohio.
International Minerals and Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Link-Belt Company, Philadelphia, Chicago.
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GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
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MACHINERY—Tankage and Fish Scrap
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MAGNETS
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Sackett & Sons Co., The A. J., Baltimore, Md.
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MANGANESE SULPHATE
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Tennessee Corporation, Atlanta, Ga.

MIXERS
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

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Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.

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Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Virginia-Carolina Chemical Corp. (Mining Dept.), Richmond, Va.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
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PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

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RINGS—Sulphuric Acid Tower
Chemical Construction Corp., New York City.

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Schmaltz, Jos. H., Chicago, Ill.
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Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Magnetic
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Link-Belt Company, Philadelphia, Chicago.
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SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
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Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
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SULPHATE OF AMMONIA
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City.

TANKAGE
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Armour Fertilizer Works, Atlanta, Ga.
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Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

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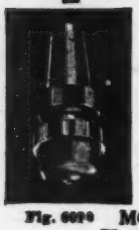

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See Catalog 6-C

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